

No. 645,208.

Patented Mar. 13, 1900.

I. MAYER & J. HÜBNER.
AUTOMATIC STOP VALVE.

(Application filed Oct. 9, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2

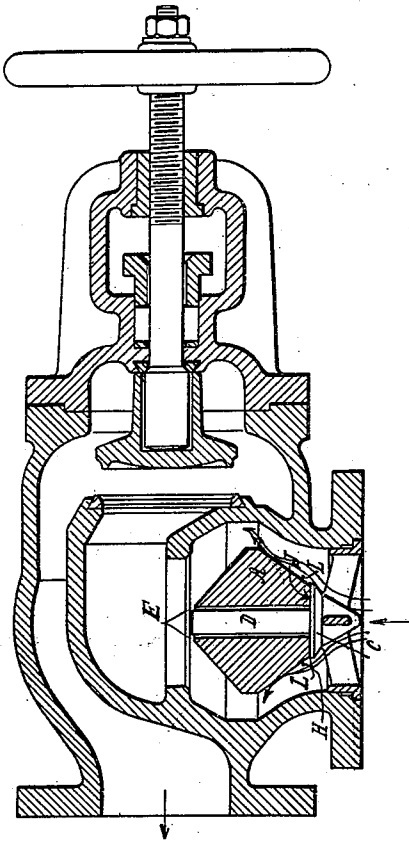


Fig. 2a

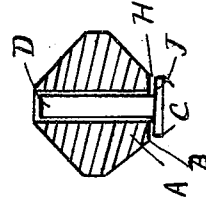


Fig. 6

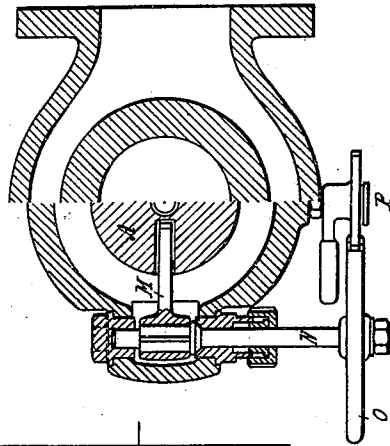
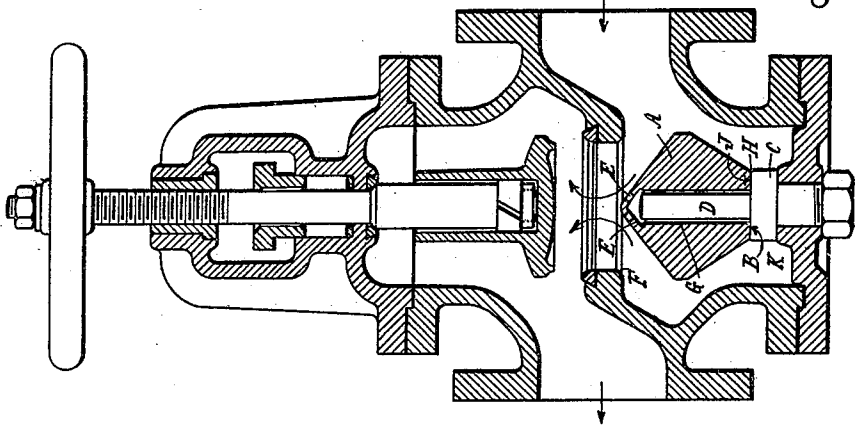


Fig. 4



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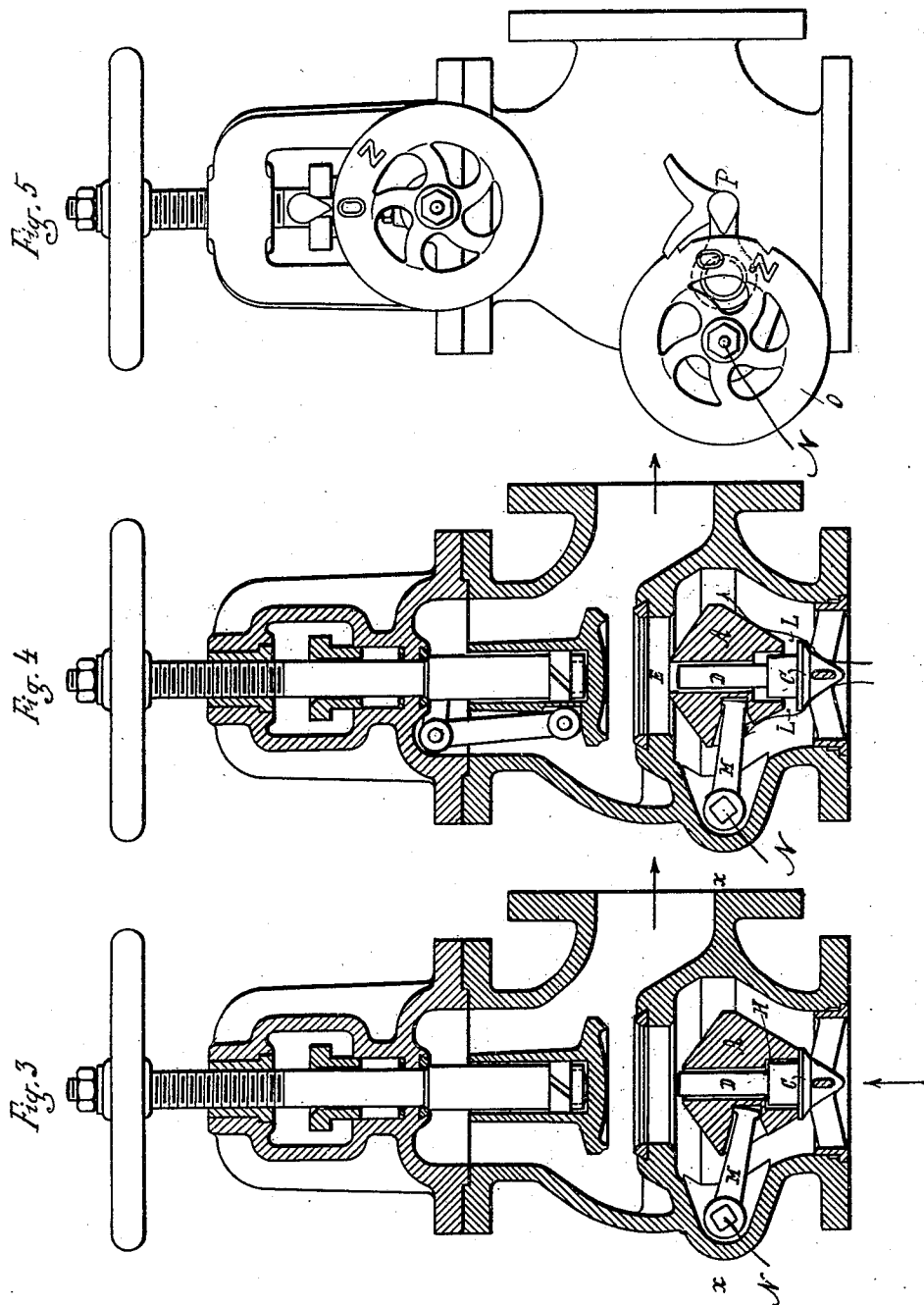
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UNITED STATES PATENT OFFICE.

ISIDOR MAYER AND JOSEF HÜBNER, OF VIENNA, AUSTRIA-HUNGARY.

AUTOMATIC STOP-VALVE.

SPECIFICATION forming part of Letters Patent No. 645,208, dated March 13, 1900.

Application filed October 9, 1899. Serial No. 732,995. (No model.)

To all whom it may concern:

Be it known that we, ISIDOR MAYER and JOSEF HÜBNER, of Vienna, Austria-Hungary, have invented a certain new and useful Automatic Stop-Valve, of which the following is a specification.

This invention relates to an improved valve for automatically shutting off the supply of steam from boilers upon the breaking of a pipe. Nearly all valves hitherto constructed for the purpose have a valve-closing body inserted in the steam-pipe and which in the normal working conditions is at rest when the passage is open, but directly the steam flows in at an abnormally-rapid rate, in consequence of the breakage of a pipe or any other irregularity, is automatically closed through the action of the ensuing diminution of pressure. Two kinds of arrangement are generally recognized, the closing body being either directly in the steam-current or outside of the same. In the first case the closing body is pushed to by means of the steam flowing in suddenly upon the breaking of the pipe in combination with the diminished pressure brought about behind the valve. In the second case—that is, when the closing body lies outside of the steam-current—it is pushed onto its seating and simultaneously pressed down by the reduced pressure arising behind the valve in consequence of the rapidly-flowing steam supported by the extra pressure prevailing under the closing body of the valve. Having regard to practical working, it thus appears to be of considerable importance that the closing of a valve of this kind should not be effected prematurely. Otherwise very disagreeable consequences may result very easily in the case of a momentary increase in the quantity of steam exhausted, as frequently happens in working.

It seems suitable that the automatic closing should only occur when the reduced pressure resulting from the sudden exhaustion of steam behind the valve extends to about twenty per cent. of the steam tension in front of the valve. This reduction of pressure never occurs in regular working, but is certain to do so upon the breaking of a pipe, and if the automatic closing of the valve is effected at this limit there is security against any undesired shutting off by the valve. Valves con-

structed in the manner hitherto known cannot fulfil this condition. In order to prevent any premature shutting off, it is necessary that with increased steam-pressure and enlarged diameter of the pipes the valve-body should be made constantly heavier or that the length of the throw should be made greater. The lengthening of the throw, however, causes the valve to act very irregularly when there is irregularity of steam-pressure, and in order to obviate this disadvantages smaller throws are adopted. Then, again, there are very considerable weights for the automatically-closing valve-body. This, however, produces other disadvantages. The larger weights require so much space that the valves cannot be produced in the normal constructional dimensions. Moreover, in the action of closing there is considerable shaking, and, finally, valves of the kind can only be put up in larger sizes in such a manner that the valve-body is arranged in a perpendicular direction, which sometimes renders their employment impossible. The slightest deviation from the perpendicular arrangement of the heavy valve-body at once produces an inclination, and thereby prevents the automatic closing. With large-size valves, moreover, the weights of the automatic-closing body in the case of moderate throws, which are desirable for precise action, are so impractically large and heavy that hitherto it has always been resolved to employ small weights with large throws, an arrangement, however, which, as described, is attended with the great disadvantage of very uneven sensibility.

Many attempts have been made to replace the necessary heavy weights of the self-closing valve-body by the arrangement of brake-pistons or springs and the like acting in a sense opposed to the force of gravitation, or, in other words, to the closing direction. All these forms of construction have been found to be unreliable and labor under the fundamental error that such valves at the utmost effect the automatic shutting off at the right moment for a certain steam-pressure—that is in the case of a reduction of pressure of about twenty per cent.—but immediately become over or under sensitive if the steam-pressure for which they are regulated is not preserved

during the working, but becomes greater or less.

The object of this invention is to provide a valve which is free from these disadvantages and effects the closing automatically and under all degrees of steam-pressure which occur, with very considerably reduced weights of the automatic valve-closing body when the reduction of pressure reaches a certain determined fraction of the steam-pressure prevailing at the time. This is attained by a suctional action produced by means of the steam flowing through, the object of which is to keep the valve-body away from the closing position, and thus to a certain extent to increase the actual weight of the valve-body. This suctional action is further proportional to the prevailing steam-pressure, and thus creates for all conditions of working the ideally-correct weight of the valve-body. At the moment when the reduction of pressure has reached a certain point it is overcome by the pressure which effects the automatic closing, as the suctional, or, in other words, pressure, effect of the quickly-flowing steam, and at this moment the automatic closing of the valve is effected with certainty and without any shock.

In the accompanying drawings some valves constructed in accordance with the invention are illustrated by way of example.

Figure 1 is a sectional elevation of a valve with a valve-closing body placed outside the steam-current. Fig. 2 is a sectional elevation of a cheek-valve with the valve-closing body placed in the steam-current. Fig. 2^a is a detached view of the valve body and seat; Fig. 3, a sectional elevation of a cheek-valve fitted with mechanism for raising the valve-body. Fig. 4 is a similar view of the same valve with the valve-body somewhat raised; Fig. 5, an elevation, and Fig. 6 a horizontal section, of the same on line *xx* in Fig. 3.

All the valves are combined with return cut-off valves, which, however, form no part of this invention and, as a matter of course, may be omitted.

With reference to Fig. 1 of the drawings it will be seen that the automatically-closing valve-body A is inside the valve-casing and outside the steam-current. The body A is bored centrally and is seated with its lower even surface B on a bearing C, which carries the spindle D, that projects into the cylindrical bore of the body A. Above the spindle D the body A is cone-shaped and furnished with one or more openings E. This characteristic form is common to all the modifications illustrated. The steam flowing in the direction of the arrow produces in the known manner a local reduction of pressure above, or, in other words, behind, the cone-shaped upper part of the closing body A by its ejection-like action, which exercises a raising effect on the closing body and to a greater extent in proportion to the degree of the steam-pressure and its velocity and the nearer the closing body A is to its seating-ring F.

As already explained, the weight for the closing body must be increased in proportion as the diameter of the valve is enlarged and the steam-pressure increased and the smaller throw up to the closing position. In the present arrangement the reduction of pressure above the cone-shaped point or head of the body A produces a suctional action through the openings E and so a reduction of pressure in that direction, which extends through the pipe-shaped slit G between the spindle D and the bore of the body A to the ring-shaped slit H between the lower surface B of the body and the upper seating-surface J of the bearing C when body A is slightly raised therefrom. Slit H is most clearly shown in Fig. 2^a. By this suctional action the body A is pressed down forcibly onto the seating-surface J of the bearing C and with greater force as the steam-pressure and the velocity of the current increase and in exact proportion as required by the ideally-necessary increase of weight in the closing body in order that no premature automatic closing may occur. If now the reduction of pressure above the valve A exceeds a certain degree—viz., that at which with suitable determined dimensions—the automatic closing should occur the constantly-increasing suctional action of the quickly-flowing steam preponderates on the whole upper surface of the body A, and supported by the extra pressure of the steam confined in the chamber K the automatic closing occurs precisely, but proportionately slowly and without shock. As will also be seen, the same purpose is effected by the suctional action produced at the slit H between the seating-surface B of the body A and the upper surface J of the bearing C, as by the employment of suitably-large weights for the body A, this suctional action being to certain extent the same as the creation of an ideal weight and securing the same advantages—viz., a sufficiently-late shutting off, with proportionally-small throw—without, however, being burdened with the disadvantages attending the employment of large weights, as described.

Fig. 2 illustrates the form of the valve-body A in a cheek-valve when the former is placed in the steam-current. In this case also the body A is seated on the seating-surface J of the bearing C and has a suction-opening E. In this figure only one such central opening E is formed in the diameter of the spindle, and it is easy to see that the number and size of the openings E are determined by the extent of the suctional action at the slit H and render possible a variation in the moment at which the automatic closing occurs. In this arrangement, moreover, the bearing C, as well as the lower part of the valve-body A, is brought to a head in the form of a cone against the inflowing steam partly for the purpose of diminishing the resistance occurring upon the inflowing, but particularly with the object of supporting the suctional action to be pro-

duced in the slit H. As will be seen, the diameter of the upper surface of the bearing C is somewhat larger than that of the under seating-surface of the valve-body A. Hereby through the steam flowing upward around the cone-shaped bearing C along the line indicated by arrows in Fig. 2 and acting like an injector a reduction of pressure is effected in the circular hollow space L, which, as will be seen, at once extends to the slit H and hereby strongly supports the suctional action already described introduced by the upper openings E along the spindle D. This arrangement, with the valve-body in the flowing steam, acts, as can be seen, substantially in a similar manner as that represented in Fig. 1 by means of the suctional action of the seating-slit H.

The arrangement illustrated in Figs. 3 and 4 in connection with a cheek-valve is similar to that in Fig. 2 and differs only in the position of the connections. Moreover, in this case the valve-body A is arranged to be raised by means of a lever M, which projects into the same. The lever M is seated on the spindle N, which projects beyond the casing. This spindle carries the hand-wheel O, bearing the inscriptions "Shut" and "Open" and in addition to this an adjusting-tappet P of any preferred construction. Hereby it is possible to close and to open the valve-body A from outside in the manner known to regulate its position from outside also and finally to fix it in any position. In order that the valve may be more sensitive, as is sometimes desired, the closing body A in this arrangement can be raised to a certain extent by turning the rotary lever M. (See Fig. 4.) In order that the described suctional action at the slit H may be assured in every position, the lower part of the body A in this arrangement engages with the seating plate or bearing C in such a manner that the suctional action at the slit H necessary for the special working is assured in every position. This arrangement is thence exactly similar in its action as that described in Fig. 2.

As will readily be seen, the valve for use in case of the breaking of a pipe and as constructed according to this invention renders possible the sure working in all conditions and positions, as no "crowding" of the weight, which in spite of the shortness of the throw is very light, can occur, and the suctional action at the seating-slit described and which produces the peculiar action of this valve is obviously quite independent of the force of gravitation.

We claim—

1. In an automatic stop-valve, the combination with a valve-case, having a horizontally-arranged valve-seat, of a fusiform valve-body,

truncated at its bottom end, the said valve-body being located below the said valve-seat, and adapted to move toward it, a cylindric stud arranged below the base of the valve-body, and adapted to support the said valve-body, and a passage or passages extending from the top of the valve-body to its base, substantially as and for the purpose described.

2. In an automatic stop-valve, the combination with a valve-case, having a horizontally-arranged valve-seat, of a fusiform valve-body, provided with an axial bore and truncated at its bottom end, the said valve-body being located below the said valve-seat, and adapted to move toward it, a cylindric stud arranged below the truncated bottom end of the valve-body and adapted to support the said valve-body, and a rod extending from the top surface of the said stud into the axial bore of the valve-body, the said rod being of such a diameter as to form with the sides of the axial bore of the valve an annular free space, substantially as and for the purpose described.

3. In an automatic stop-valve, the combination with a valve-case, adapted to have the steam flowing through it from below upward, and having the valve-seat arranged horizontally, of a fusiform valve-body, truncated at its bottom end, the said valve-body being located below the said seat and adapted to move toward it, a cylindric stud arranged below the truncated bottom end of the valve-body, the said stud being adapted to support the said valve-body and being of larger diameter than the base of the valve-body so as to extend a little beyond said base, and a passage or passages extending from the top of the valve-body to its bottom, substantially as and for the purpose set forth.

4. In an automatic stop-valve, the combination with a valve-case, having a horizontally-arranged valve-seat, a fusiform valve-body with a central opening, the valve truncated at its bottom, the valve-body being located below said valve-seat, and adapted to move toward it, a stud fixed to the case below the valve and extending upwardly into said opening and but partially filling the opening, the upper end of the opening being in communication with the space above the top of the valve and with a space or slit under a part of the valve-body, whereby the suctional action of fluid flowing by the top of the valve increases the pressure required to close the valve, as set forth.

Signed at Vienna, Austria-Hungary, this 26th day of September, 1899.

ISIDOR MAYER.
JOSEF HÜBNER.

Witnesses:

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AUGUST FUGGER.